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09/855,506	05/16/2001	Koichi Kamon	44084-494	9434

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EXAMINER	
STREGE, JOHN B	

ART UNIT	PAPER NUMBER
2625	4

DATE MAILED: 05/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/855,506	KAMON ET AL.	
	Examiner	Art Unit	
	John B Strege	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 May 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 May 2001* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 3.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 discloses contradictory information in that the of the exposure of the area sensor is dependent on the light propagation time, and the exposure of the sensor is independent of the light propagation time. Examiner will interpret the claim as being dependent on the light propagation time.

3. Claims 13 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 13 refers to "unobnoxious" environment light on line 7, and claim 14 to "unobnoxious" differences on line 6. It is unclear what is meant by this and there is no support for the word in the specification. The examiner will interpret this to mean uniform.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claim 1, 3-5, 11-12, and 14-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Yahav et al. USPN 6,091,905 (hereinafter "Yahav").

Claim 1 discloses, "a three-dimensional measurement method for measuring a distance to a plurality of positions on an object by projecting light and receiving light reflected from the object, said three-dimensional measurement method comprising the steps of: projecting a pulse light on an object; receiving light reflected from the object by an area sensor comprising a plurality of photoelectric conversion elements; controlling the active/inactive timing of the area sensor such that the photoelectric conversion elements are exposed to light with a timing synchronously with the pulse light projection; and measuring the distance to each photoelectric conversion element based on the output of the area sensor."

Yahav discloses a three-dimensional camera, and a system for accurately determining the distance to various objects and portions of objects in a scene (col. 1 lines 4-8). A source of radiation 10 (figure 1) directs radiation at the scene (col. 3 lines 8-9). This radiation is visible or infrared radiation, such as laser radiation or stroboscopic light (col. 3 lines 16-17). Yahav further states that one can use both continuous radiation and pulsed radiation (col. 6 lines 29-31). The system further includes a detector to receive the radiation reflected from the object in the scene (col. 3 lines 19-20). The detector may be any suitable detector with a suitable number of gray levels including, a

photographic camera, electronic camera, video camera, or a CCD camera (col. 3 lines 22-26). A CCD has a plurality of photoelectric conversion elements. Yahav further discloses that the simultaneous control of the source modulator 16 and detector modulator 18 may be synchronous so that the operation of both radiation source 10 and detector 12 is affected in the same way at the same time, i.e., synchronously (col. 4 lines 14-33). Finally the system further determines the distances to various objects and portions of objects in the scene being examined (col. 4 lines 36-39).

Regarding claim 3, Yahav discloses that during each cycle, both laser 10 and reflected radiation are active for a time a and are inactive for a time b. The times a and b may be the same or different (col. 5 lines 2-5).

Regarding claim 4, as seen in figures 2, the CCD follows a cycle where it is active for a time period a and inactive for a time period b, thus an exposure would be obtained for each time period a giving multiple exposures.

Regarding claim 5, as seen in figure 3 Yahav discloses that radiation source may be modulated harmonically (col. 5 lines 57-59). Thus a plurality of exposures is obtained within a period of pulse light projection.

Claim 11 is similar to claim 1 thus the same arguments apply equally to the limitations of claim 11. Claim 11 further discloses that while the sensor is active, the light received by the sensor being converted to electric signal relative to quantity of the received light. Yahav discloses analyzing the radiation detected by detector 12, and since the detector can be a CCD this includes converting the light to an electrical signal.

Regarding claim 12, as can seen in figure 2 there are a plurality of time frames wherein the emission time eriod is repeated and the sensing time period is repeated to synchronize with the emission time period in the time frame. As stated above a distance data is obtained by the electric signal.

Regarding claims 14-15, Yahav discloses that during each cycle, both laser and reflected radiation are active for a time a and are inactive for a time b. The times a and be may be the same or different (col. 5 lines 2-5).

Claim 16 has similar limitations to claim 1, thus the same arguments used for claim 1 apply equally to claim 16.

Regarding claim 17, Yahav discloses that the detector may be a CCD camera (col. 3 line 26).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2, 6,8-10, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yahav et al. USPN 6,091,905.

Regarding claim 2, Yahav discloses all of the limitations of claim 1 and that the distance is measured by analyzing the radiation detected by the detector 12 (col. 4 lines 34-39). Yahav does not explicitly disclose that the amount of exposure of the area sensor is dependent on the light propagation time. However it is well known that with

conventional film the degree of exposure is determined by the exposure time and for this the examiner declares official notice. Yahav discloses that multiple types of detectors may be used and one of these is a photographic film camera (col. 3 lines 25-26). Thus it would have been obvious at the time of the invention to one of ordinary skill in the art to control the sensor such that the amount of exposure of the area sensor is dependent on the light propagation time since this is the conventional method.

Claim 6 discloses, "A three-dimensional measurement device for measuring the distance to a plurality of positions on an object by projecting light and receiving the light reflected from the object, said three-dimensional measurement device comprising: a projector for projecting pulse light on an object; an area sensor comprising a plurality of photoelectric conversion elements for receiving light reflected from the object; a controller for controlling the ON/OFF states of the photoelectric elements with a timing synchronized with the pulse light projection; and a processor for eliminating the fluctuating component of the received light intensity due to distance or reflectivity of the object from the amount of exposure obtained based on the ON/OFF control."

The projector and sensor limitations have already been discussed in the above rejection. Yahav further discloses a mechanism for controlling the source modulator 16 and detector modulator 18 to be synchronous (col. 4 lines 14-28). Yahav further discloses alternate activating and deactivating of radiation source 10 and the detector 12 (col. 3 lines 37-40).

Yahav does not explicitly disclose a processor for eliminating the fluctuating component of the received light intensity. Yahav discloses that dividing the intensity of

each pixel during the continous period by the intensity of the same pixel during the pulsed period can compensate for differences in reflectivity of the object (col. 6 lines 39-49).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a processor to eliminate the fluctuating component of the received light intensity due to reflectivity using a processor based on the modulated sensor and detector control. Applicant has not disclosed that doing so provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with the method disclosed by Yahav because Yahav also compensates for the differences in reflectivity of the object.

Therefore, it would have been obvious to one of ordinary skill in this art to modify Yahav with a processor for carrying out the procedure he discloses to obtain the invention as specified in claim 6.

Claim 10 discloses, "a three-dimensional measurement method for measuring a distance to a plurality of positions on an object by projecting light and receiving light reflected from the object, said three-dimensional measurement method comprising the steps of: sequentially projecting light of a first luminance distribution and light of a second luminance distribution on an object; receiving light reflected by the object in each projection cycle by a solid state area sensor comprising a plurality of photoelectric elements; and measuring the distance to each photoelectric element based on the

output of the solid state area sensor in a first projection and the output of the solid state area sensor in a second projection."

Claim 10 has similar limitations to claim 1, therefore only the differences will be addressed. Yahav discloses receiving the light reflected by a CCD (col. 3, line 26), which is a solid state sensor. As discussed above the detector measures the distance from the CCD to the object based on the intensity detected, and this is based on the varying radiation source.

Yahav does not explicitly disclose sequentially projecting light of a first luminance distribution and light of a second distribution on an object. However Yahav does disclose that the word modulate discussed is intended to include any varying of the level of operation or any operating parameters of the radiation source and detector (col. 3 lines 33-40), and the radiation and detector source can be physically blocked with a shutter 17 or similar element (optical unit) (col. 3 lines 40-44). Yahav further recites that the radiation source may be modulated harmonically as shown in figure 3, which can be seen as projecting multiple luminance distributions produced by moving the shutter. Furthermore Yahav discloses that the source of radiation can be a stroboscopic light (col. 3 line 17), which inherently projects light of varying luminance distributions. If a harmonic modulation is used then the detector would receive light in each recurring cycle as shown in figure 3.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to project a first luminance distribution and a second luminance distribution to measure the distance of an object. Applicant has not disclosed that

projecting a first luminance distribution and a second luminance distribution provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with stroboscopic light or a harmonically modulated radiation source because they are also projecting various luminance distributions.

Therefore, it would have been obvious to one of ordinary skill in this art to modify Yahav by projecting two different luminance distributions instead of a sinusoidally varying luminance distribution to obtain the invention as specified in claim 8.

Claim 8 is dependent on claim 6, and discloses similar limitations to claim 10, thus the arguments above apply equally to the rejection of claim 8.

Regarding claim 9, since the detector device is a CCD and the modulation is done harmonically it would be obvious to one of ordinary skill in the art that the control of the photoelectric elements is accomplished differently for each line of the area sensor.

Claim 18 is dependent on claim 16. Yahav does not explicitly disclose that the sensor uses a metal-oxide semiconductor.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use a metal-oxide semiconductor as a sensor. Applicant has not disclosed that using a metal-oxide semiconductor provides an advantage, is used for a particular purpose or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with a CCD because it also detects the intensity of the light.

Therefore, it would have been obvious to one of ordinary skill in this art to modify Yahav with a metal-oxide semiconductor to obtain the invention as specified in claim 18.

Regarding claim 19, a CCD has a plurality of pixels, and furthermore Yahav discloses compensating for reflectivities by dividing the intensity of each pixel during the continous period by the intensity of the same pixel during the pulsed period (col. 6 lines 45-50).

6. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yahav in view of Tanaka USPN 6,252,655.

Yahav discloses the limitations of claim 6.

Yahav does not disclose expressly an internal optical path, wherein the measurement value is corrected in accordance with the amount of exposure.

Tanaka states that there is a reflectivity problem in the prior art that makes it difficult to measure the distance of an object with high accuracy (col. 1 lines 42-55). To solve this problem Tanaka discloses an internal optical path that is used for obtaining a predetermined standard level employed for light quantity equilibration (col. 1 lines 51-54 and lines 65-67). This equilibration can be read as a correcting of the light.

Yahav & Tanaka are combinable because they are from the same field of endeavor of distance measuring using a pulse emitting system.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use an internal optical path with the invention of Yahav to correct the measurement value in accordance with the amount of exposure.

The suggestion/motivation for doing so would have been to solve the problem caused by highly reflective objects.

Therefore, it would have been obvious to combine Yahav with Tanaka to obtain the invention as specified in claim 7.

7. Claims 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yahav in view of Kitajima et al. USPN 4,947,202 (hereinafter "Kitajima").

Yahav discloses the limitations of claim 12.

Yahav does not disclose expressly that emission is stopped in a second time frame while the sensing time period is repeated, wherin the distance data is obtained as uniform environment light.

Kitajima discloses in figure 7 that a first luminance distibution 39 is obtained when the sensor array 2 receives any one of the reflection lights 18, 24, and 27, and a second luminance distribution 40 is obtained without the use of the auxiliary light beam 15a (col. 8 lines 45-51).

Kitajima & Yahav are combinable because they are from the same field of endeavor of distance measurement.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to stop the emission while continuing to detect ambient light.

The suggestion/motivation for doing so would have been to account for the ambient light that is entering the system.

Therefore, it would have been obvious to combine Yahav with Kitajima to obtain the invention as specified in claim 13.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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